



Illinois Department of Transportation

Division of Highways / Bureau of Construction
2300 South Dirksen Parkway, Springfield, Illinois 62764

Subject:
Guidelines for Pumping
of Bridge Deck Concrete

CONSTRUCTION MEMORANDUM NO. 13-74

Effective

April 1, 2013

Expires

Indefinite

The purpose of this memorandum is to provide guidelines for the placement of bridge deck concrete with concrete pumps. This memorandum supersedes Construction Memorandum 07-74 dated May 15, 2007.

1. MIX DESIGN

- a. The mortar factor shall not exceed 0.86 as indicated in the current "Portland Cement Concrete Level III Technician Course – Manual of Instructions for Design of Concrete Structures".
- b. When the atmosphere or concrete temperature is 65°F (18°C) or higher, retarding and high range water reducing admixtures in accordance with Article 1020.05(b)(1) shall be used. The Resident is advised that when a retarder is used, its function is to counter the rapid setting caused by high temperatures, and thus maintain the normal concrete set time. However, for bridge deck pours, the retarding admixture is also used to delay the normal concrete set time. The set time is delayed to prevent cracks in the completed work, which may occur because of deflections due to the concrete dead load.

2. PLANT AND PROPORTIONING

- a. The Standard Specifications require mix water to be added at the concrete plant. If continuous adjustments in water are required at the jobsite, the proportioning technician shall be notified so that appropriate adjustments can be made at the plant. When it is necessary to add water at the jobsite, 40 additional revolutions at mixing speed shall be required on the mixer.
- b. When multiple admixtures are added to the truck mixer at the jobsite, the manufacturer's recommendations for sequence of addition should be followed unless indicated otherwise by the specifications. When an admixture is added at the jobsite, the concrete batch shall be mixed a minimum of 40 additional revolutions after each addition.
- c. Concrete which is significantly modified at the jobsite, after testing, shall be retested for acceptance.

3. PLACEMENT

- a. A prepour conference should be held with the Contractor, Concrete Supplier and materials personnel to discuss proportioning, delivery and method of placement.
- b. The mortar used to provide initial lubrication for the pump line shall be wasted. The wasted mortar shall not be placed in any existing stream or drainage way.
- c. When a horizontal pump line is used, a protective cover shall be placed under each joint to prevent spillage of concrete onto the reinforcement bars and deck forms when the sections of the pump line are removed during placement. The protective covering also serves to protect the epoxy coating.
- d. When air entrained concrete is pumped, an accessory or accessories shall be incorporated in the discharge components to minimize air loss. The maximum allowable air loss caused by the pumping operation shall be 3.0 percent with the minimum air content at the point of discharge meeting the requirements of Article 1020.04.

In terms of using an accessory to minimize air loss, typically an elbow or reducer is used. The elbow configuration will normally consist of two elbows with 90 degree bends connected to make an "S" shape. The reducer will narrow the diameter from one end to the other, such as from 5 in. (127 mm) to 4 in. (102 mm). At the very end of the pump is a rubber hose, which is less hazardous to personnel than metal accessories.

Other methods for reducing air loss in pumped concrete are to reduce height of free fall, reduce boom angles, keep pumping pressure low, use slow rate of pumping, and reduce friction on hose walls.

When reviewing configurations used by the Contractor, keep in mind that the purpose is to prevent segregation of the mix, minimize concrete air loss, and reduce the potential for damage to the epoxy coated reinforcement. The concrete should look like tooth paste as it comes out of the tube.

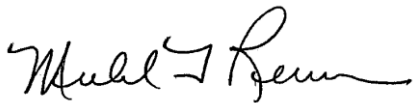
- e. The pump hopper should be located at an elevation lower than the elevation of the truck discharge. This can be accomplished by constructing a ramp for the trucks or by excavating the area where the pump is located. The difference in elevation allows for the proper discharge of the concrete mix without the addition of water.
- f. Water shall not be added to the pump hopper. If water is added to remove a line blockage, the concrete shall be wasted.
- g. The use of aluminum pipes or other aluminum accessories that come into contact with the concrete shall not be allowed.

4. TESTS

- a. The slump may be adjusted at the jobsite when required to improve workability of the concrete mix provided the maximum water/cement ratio, per Article 1020.04, is not exceeded. If continuous adjustments are required, the proportioning technician shall be notified so that the appropriate adjustments can be made at the plant.
- b. Air tests shall be taken for each load. A correction factor shall be established to allow for a loss of air content during transport. The first three truck loads delivered shall be tested, before and after pumping, to establish the correction factor. Once the correction is determined, it shall be rechecked after an additional 50 cu. yd. (40 m³) is pumped. This shall continue throughout the pour. If the re-check indicates the correction factor has changed, a minimum of two truck loads are required to re-establish the correction factor. The correction factor shall also be re-established when significant changes in temperature, distance, pump arrangement, or other factors have occurred. If the correction factor is greater than 3.0 percent, the Contractor shall take corrective action to reduce the loss of air content during transport by the pump.

The air content should be near the midpoint of the range, after the correction factor has been applied. If the air content is not near the midpoint, adjustments are needed at the plant. If air content tests indicate significant air loss, the problem should not be solved by increasing the air content above the upper specification limit. A lower slump concrete or change in pump arrangement can cause less air loss. Thus, the air content at the discharge end would exceed the upper specification limit. The best alternative is to reduce air loss by changing the pump arrangement, or by making minor mix adjustments at the plant.

If circumstances require the air content at the pump hopper to exceed specification limits, subsequent air tests shall be made at the end of the pump discharge line to ensure that the correction factor remains valid and that the concrete being placed is within specification limits. The IDOT inspector or contractor shall record all air content test results, correction factors, and corrected air contents. The corrected air content is to be reported on form MI 654.



Michael F. Renner, P.E.
Acting Engineer of Construction